

Water Requirements of Lactating Cows

When we talk to producers about feeding and nutrition, the current 'hot topics' include inert fat, soluble protein and chelated minerals. We seldom discuss water. But water is one of the most critical nutrients for the cow and the one she has the greatest requirement for every day.

Inadequate water consumption results in reduced feed intake and production. Figure 1 shows the results of an experiment where water consumption was limited to 80% or 60% of unrestricted intake. This was British work, so the production levels are much lower than ours, but the effect of decreased water availability is clear.

In another British experiment, cows were deprived of water for three days. Decreases in feed intake and milk yield for each successive day are shown in figure 2.

Water intake requirements

How much drinking water do cows require?

This depends on :

- production level;
- dry matter (DM) intake;
- salt consumption;
- environmental temperature and humidity, and;
- ration moisture content.

The first four of these factors have been incorporated into an equation which can be used to estimate water intake, as follows :

$$\begin{aligned}
 \text{WATER INTAKE (litres/day)} &= 15.99 \\
 + 1.58 \times \text{DM intake (kg/day)} & \\
 + 0.9 \times \text{milk yield (kg/day)} & \\
 + 0.05 \times \text{sodium (Na) intake (g/day)} & \\
 + 1.2 \times \text{weekly avg min temp (}^\circ\text{C)} &
 \end{aligned}$$

The table below demonstrates the use of this equation with a few examples :

		----- EXAMPLES -----				
		1	2	3	4	5
DM intake	kg	18	22	25	22	22
milk yield	kg	25	35	45	35	35
Na intake	grams	36	44	50	88	44
avg temp	°C	5	5	5	5	10
water intake	litres	75	90	104	93	96

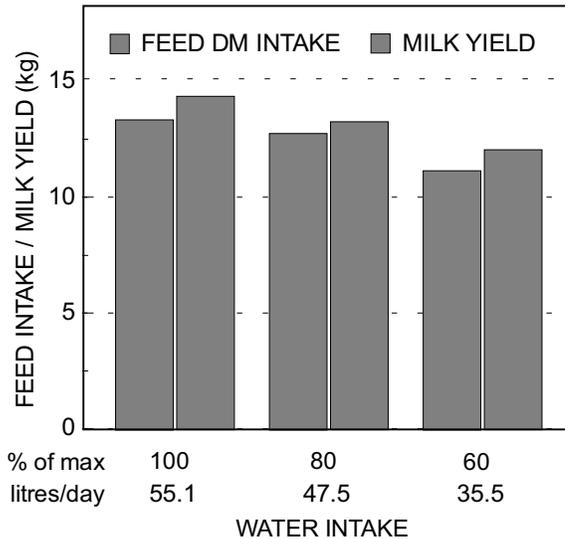


Figure 1 : When water intake was limited to 80% or 60% of unrestricted consumption, both dry matter intake and milk yield decreased.

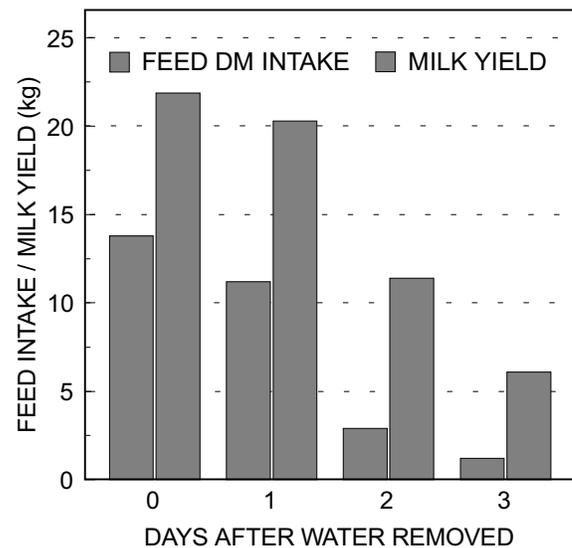


Figure 2 : When cows (20 - 60 days in milk) were deprived of water for three days, feed intake and milk production dropped sharply.

Ration moisture content influences the amount of water cows will drink in two ways. First, wet feed intake increases as ration moisture level rises to about 45-50% and the amount of water consumed as part of the ration increases. As you might expect, this decreases the amount they drink. Secondly, ration dry matter intake will

decreases as rations get wetter. As indicated in the equation above, reduced dry matter intake results in lower water consumption. The net effect is that total water intake will decline as ration moisture content increases. The data in the table on the right are the results of a trial which examined the effects of ration moisture level on feed and water intake.

Intakes kg/day	Ration moisture content (%)			
	30.7	42.6	48.3	53.6
Wet feed	28.4	31.7	33.1	31.9
Dry matter	19.7	18.2	17.1	14.8
Water :				
From waterer ...	68.6	60.5	53.3	43.1
In feed	14.5	21.4	20.4	18.7
Total.....	83.1	81.9	73.7	61.8

Indicators that cows may not be consuming adequate water include :

- poor feed intake and milk production;
- firm, dry constipated manure;
- decreased urine output;
- drinking from puddles, mud holes or urine pools.

Several factors will affect the amount of water cows can or will drink voluntarily. These include :

- water temperature - ideal is about 20 °C.
- water quality - the table below suggests critical acceptability limits for measures of water quality.
- type of waterer - although cows can satisfy their requirements from either bowls or troughs, they will drink more frequently from bowls and spend more time drinking, partly because rate of consumption is lower. Inadequate water flow rate into bowls can affect water intake and production.

- accessibility of waterers - when cows were fed a TMR (total mixed ration) 1, 2, 4 or 8 times/day, peak water consumption coincided with peak feed intake. If given the opportunity, cows will consume feed and water alternately. Therefore waterers should be readily accessible and in close proximity to feed.
- stray voltage - although cows will apparently adapt to continuous stray voltage at their water source, the time taken to adapt may mean that periodic stray voltages may reduce consumption.

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MEASURE	CRITICAL LEVEL	SYMPTOMS ABOVE/BELOW CRITICAL LEVEL
pH	under 5.5	acidosis, low feed intake, low production
	over 8.3	alkalosis, low production, vitamin B deficiencies
dissolved solids	over 1000 mg/L	temporary diarrhea, no long-term effect
	over 5000 mg/L	chronic diarrhea, slight reduction in production and health
	over 10000 mg/L	severe health problems, reduced water consumption
sulfate	over 1000 mg/L	temporary diarrhea, no long-term effect
	over 2000 mg/L	chronic diarrhea, suspected reduced production
chloride	no level established,	contributes to dissolved solids
sodium	over 800 mg/L	diarrhea, slight decrease in production
calcium	no level established,	contributes to dissolved solids
magnesium	possibly 400 mg/L	diarrhea
iron	possibly 0.3 mg/L	reduced water intake and production
copper	possibly 0.6 mg/L	liver damage
arsenic	over 0.2 mg/L	-
cadmium	over 0.05 mg/L	poor performance, anemia and kidney damage
lead	over 0.1 mg/L	lead poisoning
nitrate	100-300 mg/L	safe, unless feeds also contain nitrate
	over 300 mg/L	reduced performance, abortions, infertility and respiratory failure
nitrite	over 4 mg/L	symptoms same as nitrate
coliform bacteria	over 1/100 ml	scours in calves
	over 20/100 mL	health risk to cows, diarrhea, off-feed problems
source : Ontario Ministry of Agriculture, Fisheries and Food		